

WHAT IS CLAIMED IS:

1. A multi-layer film comprising:
a first layer comprising a fluorinated polymer; and
a second layer comprising a melt strain-hardening component and comprising no more than about 30% by volume of the multi-layer film.
2. The multi-layer film of claim 1, wherein the second layer consists essentially of the melt strain-hardening component.
3. The multi-layer film of claim 1, further comprising a third layer comprising the fluorinated polymer and comprising greater than about 40% by volume of the multi-layer film.
4. The multi-layer film of claim 3, wherein the third layer comprises greater than about 20% by weight of the fluorinated polymer.
5. The multi-layer film of claim 4, wherein the third layer comprises less than about 80% by weight of the melt strain-hardening component.
6. The multi-layer film of claim 3, wherein the third layer comprises the melt strain-hardening component and greater than about 30% by weight of the fluorinated polymer.
7. The multi-layer film of claim 3, further comprising:
a fourth layer comprising the melt strain-hardening component and comprising no more than about 20% by volume of the multi-layer film; and
a fifth layer comprising the fluorinated polymer.
8. The multi-layer film of claim 7, wherein the second layer and the fourth layer in combination comprises no more than about 40% by volume of the multi-layer film.

9. The multi-layer film of claim 1, wherein the second layer comprises no more than about 10% by volume of the multi-layer film

10. The multi-layer film of claim 1, wherein the second layer comprises about 5% by volume of the multi-layer film.

11. The multi-layer film of claim 1, wherein the fluorinated polymer comprises PVDF.

12. The multi-layer film of claim 1, wherein the melt strain-hardening component comprises a non-polyolefin polymer.

13. The multi-layer film of claim 1, wherein the melt strain-hardening component comprises a linear chain polymer.

14. The multi-layer film of claim 13, wherein the linear chain non-olefin polymer is an impact grade acrylic

15. The multi-layer film of claim 1, wherein the melt strain-hardening component comprises an impact grade acrylic.

16. The multi-layer film of claim 1, wherein the melt strain-hardening component exhibits increasing tensile force between the draw ratios of about 5:1 and about 30: 1.

17. The multi-layer film of claim 1, wherein the melt strain-hardening component exhibits increasing tensile force between the draw ratios of about 10:1 and about 15: 1.

18. The multi-layer film of claim 1, wherein the melt strain-hardening component exhibits a positive smoothed slope of change in tensile force to change in draw ratio in the draw ratio domain between a first draw ratio and a second draw ratio.

19. The multi-layer film of claim 18, wherein the first draw ratio is 10:1 and the second draw ratio is 15:1.

20. The multi-layer film of claim 18, wherein the first draw ratio is 20:1 and the second draw ratio is 30:1.

21. The multi-layer film of claim 18, wherein the positive slope is not less than 0.03 cN.

22. The multi-layer film of claim 1, wherein the second layer comprises greater than about 70% by weight melt strain-hardening component.

23. The multi-layer film of claim 1, wherein the second layer comprises the fluorinated polymer and greater than about 70% by weight impact grade acrylic.

24. The multi-layer film of claim 1, wherein the first layer defines a first surface, wherein the second layer defines a second surface that is opposite the first surface, and wherein the melt strain hardening component comprises acrylic, the multi-layer film further comprising an internal layer comprising greater than about 40% by weight fluorinated polymer.

25. The multi-layer film of claim 1, further comprising a third layer comprising greater than about 55% by weight acrylic.

26. The multi-layer film of claim 25, wherein the third layer defines a surface.

27. The multi-layer film of claim 25, further comprising a fourth layer comprising greater than about 30% by weight of a fluorinated polymer.

28. The multi-layer film of claim 27, wherein the first layer defines a first surface, wherein the third layer defines a second surface that is opposite the first surface, and wherein the second layer and fourth layer are located between the first layer and the third layer.

29. The multi-layer film of claim 1, wherein the first layer comprises acrylic and greater than about 30% by weight fluorinated polymer and wherein the second layer defines a surface.

30. The multi-layer film of claim 1, further comprising a third layer comprising greater than about 55% by weight acrylic wherein the third layer defines a surface.

31. A multi-layer film comprising:

a first layer comprising greater than about 70% by weight of a non-polyolefin melt strain-hardening polymer, the non-polyolefin melt-strain hardening polymer having an increasing tensile force in a draw ratio domain between draw ratios of about 5:1 and about 30:1, the first layer comprising no more than about 30% by volume of the multi-layer film; and

a second layer comprising a second polymer, the second polymer having a generally flat tensile force in the draw ratio domain.

32. The multi-layer film of claim 31, wherein the non-polyolefin melt strain-hardening polymer comprises a linear chain polymer.

33. The multi-layer film of claim 31, wherein the non-polyolefin melt strain hardening polymer comprises impact grade acrylic.

34. The multi-layer film of claim 33, wherein the impact grade acrylic comprises an acrylic matrix having a particulate phase therein.

35. The multi-layer film of claim 31, wherein the first layer further comprises a fluorinated polymer.

36. The multi-layer film of claim 35, wherein the fluorinated polymer is PVDF.

37. The multi-layer film of claim 31, wherein the second polymer is a fluorinated polymer.

38. The multi-layer film of claim 37, wherein the fluorinated polymer is PVDF.

39. The multi-layer film of claim 31, wherein the second layer is an adhesive layer.

40. The multi-layer film of claim 31, wherein the second layer further comprises no more than about 40% by weight of the non-polyolefin melt strain-hardening polymer.

41. The multi-layer film of claim 31, wherein the second layer comprises greater than about 20% by volume of the multi-layer film.

42. The multi-layer film of claim 31, further comprising a third layer comprising the fluorinated polymer and substantially no non-polyolefin melt strain-hardening polymer.

43. The multi-layer film of claim 31, wherein the second polymer exhibits a melt plateau in the draw ratio domain.

44. The multi-layer film of claim 43, wherein the draw ratio domain is between about 10:1 and about 15:1.

45. The multi-layer film of claim 43, wherein the draw ratio domain is between about 20:1 and about 30:1.

46. The multi-layer film of claim 43, wherein the positive ratio is not less than 0.03 cN.

47. A method of manufacturing a multi-layer film, the method comprising:
extruding a first layer comprising greater than about 70% by weight of a non-polyolefin melt strain-hardening polymer, the non-polyolefin melt-strain hardening polymer having an increasing tensile force in a draw ratio domain between draw ratios of about 5:1 and about 30:1, the first layer comprising no more than about 30% by volume of the multi-layer film;
and
extruding a second layer comprising a second polymer, the second polymer having a generally flat tensile force in the draw ratio domain.

48. The method of claim 47, further comprising drawing the multi-layer film at a rate greater than about 50 feet per second with substantially no draw resonance.